NATIONAL ANNUAL SURVEY OF AVIATION FUELS, 1956

BY O. C. BLADE

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INTRODUCTION

This report on the properties of aviation gasolines and aviation jet fuels produced in the United States during 1956 was made under a cooperative agreement between the American Petroleum Institute and the Bureau of Mines of the United States Department of the Interior.

Analytical data are presented for 120 samples of aviation gasoline and for 38 samples of aviation jet fuel. The analyses were made on samples typical of the manufacturers' 1956 production in their laboratories and the results submitted to the Bureau of Mines for compilation. The products of 20 manufacturers of aviation gasolines and of 17 producers of aviation jet fuels are represented.

SUMMARY

Summarized data of the average values of the tests of commercial aviation gasolines in the present survey, from tables 7 through 11, compared with surveys of previous years, are shown in tables 1 through 5. Data for 1947, 1948, and 1949, when two surveys a year were conducted, are condensed to show averages of the test results for each year, based on the respective numbers of samples represented. Trends in certain characteristics of these fuels may be seen in figures 1 through 5, which also indicate the minimum and maximum values. Aviation-fuel-survey reports published by the Bureau of Mines are listed on page 11.

Table 6 presents a summary of data from table 12 and compares properties of aviation jet fuels of 1956 with summarized data on jet fuels of preceding years since 1951.

INSPECTION TEST DATA OF AVIATION GASOLINE

The values for the properties of the aviation gasolines were compiled from data submitted on their products by 20 manufacturers. A total of 120 samples of aviation gasoline is represented, of which 46 are for commercial use only, 24 are for military use only, and 50 are designated for both commercial and military use. The analyses are tabulated according to the following grades: 80/87, 91/96, 100/130, 108/135, and 115/145. In each grade the analyses are tabulated in the order of commercial only, commercial and military, and military only.

Each item number in tables 7 through 11 designates a separate sample. The analysis for each consists of the following test results: Octane numbers for aviation and supercharged conditions (octane numbers for 100 or below, isooctane plus

TABLE 1. - Summarized data on Grade 80/87 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Number of fuels	36	37	37	17	18	16	18	17	19	22
Octane number:										
Aviation	80.5	80.5	80.8	81.1	80.8	81.7	81.8	81.8	82.2	82.0
Supercharged	-	-	87.6	87.8	87.6	87.7	87.7	87.9	88.4	88.0
Tetraethyllead ml./gal.	None	0.14	0.16	0.19	0.25	0.53	0.52	0.43	0.44	0.41
Color	Clear 1/	Clear 2/	Clear 3/	Clear 4/	Clear 5/	Red 6/	Red 6/	Red 7/	Red 7/	Red 8/
Distillation temp.:										
10% evap. ° F.	150	147	148	145	147	147	148	147	148	148
50% evap.	197	192	194	194	191	191	191	192	194	194
90% evap.	240	236	236	239	238	236	237	234	237	232
Sum 10 + 50	347	339	342	339	338	338	339	339	342	342
Slope at 10 percent evap.	1.8	1.7	1.6	1.9	1.7	1.7	1.6	1.7	1.9	1.8
Reid vapor pressure lb.	6.4	6.4	6.2	6.6	6.5	6.5	6.4	6.5	6.4	6.5
Gum:										
Copper dish mg./100 ml.	1.2	1.1	1.1	.8	1.2	1.2	1.2	1.4	.9	.9
Potential, 16 hr.	-	-	-	1.0	1.1	1.3	1.2	1.2	1.1	.9
Heat of combustion,										
net Btu/lb.	19,175	19,180	19,170	18,994	18,989	18,969	18,952	18,880	18,881	18,888
Aniline point ° F.	145.5	142.5	142.3	141.2	140.5	134.2	135.5	135.1	138.4	136.7
Gravity ° API	69.2	69.0	68.8	68.5	68.5	67.7	68.1	67.7	68.3	68.2
Aniline-gravity constant	10,069	9,833	9,790	9,689	9,648	9,103	9,228	9,146	9,453	9,323
Freezing point ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1	No. 1
Sulfur wt. percent	0.017	0.015	0.015	0.015	0.014	0.015	0.015	0.015	0.013	0.012
Viscosity, kinematic at 70° F. cs.	.604	.593	.604	.623	.615	.611	.609	.619	.604	.586

1/ 3 samples blue. 2/ 9 samples red, 4 blue. 3/ 9 samples red, 3 blue. 4/ 7 samples red. 5/ 8 samples red, 2 blue.
6/ 2 samples blue. 7/ 1 sample clear. 8/ 3 samples clear.

TABLE 2. - Summarized data on Grade 91/96 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Number of fuels	41	37	36	15	15	15	18	19	21	21
Octane number:										
Aviation	93.1	93.1	93.1	92.6	93.1	93.0	92.5	93.3	94.2	93.8
Supercharged	98.8	98.8	98.7	99.0	98.8	98.7	98.4	98.6	98.7	98.8
Tetraethyllead ml./gal.	2.78	3.23	3.49	3.53	3.51	3.99	3.96	3.78	3.65	3.72
Color	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Distillation temp.:										
10% evap. ° F.	149	147	149	148	147	147	148	147	148	147
50% evap.	198	193	193	192	189	193	192	192	193	193
90% evap.	240	234	235	235	228	236	236	233	237	232
Sum 10 + 50	347	340	342	340	337	340	340	339	341	340
Slope at 10 percent evap.	1.9	1.7	1.6	1.9	1.7	1.7	1.8	1.7	1.8	1.8
Reid vapor pressure lb.	6.4	6.5	6.4	6.5	6.6	6.6	6.6	6.4	6.4	6.5
Gum:										
Copper dish mg./100 ml.	1.7	1.3	1.3	.7	1.0	1.1	.8	1.0	1.0	1.2
Potential, 16 hr.	-	-	-	1.0	.9	.9	.9	1.1	.8	1.0
Heat of combustion,										
net Btu/lb.	19,130	19,112	19,089	18,953	18,958	18,916	19,040	18,878	18,876	18,858
Aniline point ° F.	140.0	137.4	136.3	136.0	136.6	133.2	134.8	135.1	136.5	132.6
Gravity ° API	67.7	67.5	67.1	66.9	67.7	66.8	67.3	67.4	67.4	67.2
Aniline-gravity constant	9,478	9,275	9,146	9,113	9,255	8,906	9,072	9,106	9,200	8,911
Freezing point ° F.	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1	No. 1
Sulfur wt. percent	0.018	0.018	0.018	0.016	0.015	0.018	0.019	0.019	0.016	0.014
Viscosity, kinematic at 70° F. cs.	.606	.591	.601	.615	.609	.619	.616	.608	.602	.585

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TABLE 3. - Summarized data on Grade 100/130 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Number of fuels	42	43	40	16	16	16	21	21	26	26
Octane number:										
Aviation	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+
	0.16	0.13	0.13	0.16	0.19	0.16	0.15	0.19	0.21	0.19
Supercharged	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+
	1.36	1.36	1.36	1.36	1.31	1.36	1.35	1.35	1.34	1.34
Performance number:										
Aviation	106	105	105	106	107	106	106	107	108	107
Supercharged	131	131	131	131	130	131	131	131	131	131
Tetraethyllead ml./gal.	3.44	3.65	3.81	3.46	3.52	4.05	4.05	3.81	3.75	3.71
Color	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Distillation temp.:										
10% evap. ° F.	151	148	147	147	147	149	148	146	148	147
50% evap.	207	202	203	206	205	204	204	204	206	207
90% evap.	246	245	244	244	245	245	246	245	245	246
Sum 10 + 50	358	350	350	352	351	353	352	350	354	354
Slope at 10 percent evap.	2.3	2.1	1.9	2.2	2.0	2.0	2.1	2.1	2.3	2.3
Reid vapor pressure lb.	6.3	6.4	6.5	6.5	6.7	6.6	6.6	6.6	6.6	6.6
Gum:										
Copper dish mg./100 ml.	1.5	1.4	1.2	1.0	1.4	.9	1.0	1.2	.9	1.2
Potential, 16 hr.	-	-	-	.8	1.1	1.1	1.1	1.1	.9	.8
Heat of combustion,										
net Btu/lb.	19,200	19,132	19,130	19,034	19,046	19,022	19,009	18,941	18,927	18,921
Aniline point ° F.	153.0	148.2	144.9	152.5	152.7	149.0	146.2	146.7	144.6	144.0
Gravity ° API	69.9	69.3	68.5	70.4	70.2	69.5	69.2	69.3	68.6	68.6
Aniline-gravity constant	10,695	10,270	9,926	10,757	10,740	10,385	10,117	10,166	9,920	9,878
Freezing point ° F.	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76	< -76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1	No. 1
Sulfur wt. percent	0.018	0.018	0.020	0.015	0.013	0.016	0.018	0.017	0.015	0.016
Viscosity, kinematic at 70° F. cs.	.616	.604	.611	.620	.633	.635	.627	.632	.617	.613

TABLE 4. - Summarized data on Grade 108/135 commercial aviation gasoline

Inspection test	1952	1953	1954	1955	1956
Number of fuels	5	9	9	9	10
Octane number:					
Aviation	Iso+ 0.28	Iso+ 0.34	Iso+ 0.32	Iso+ 0.32	Iso+ 0.34
Supercharged	Iso+ 1.79	Iso+ 1.76	Iso+ 1.75	Iso+ 1.77	Iso+ 1.78
Performance number:					
Aviation	110	111	111	111	112
Supercharged	136	136	136	136	136
Tetraethyllead ml./gal.	2.94	2.99	3.10	2.89	2.92
Color	Purple 1/	Purple 1/	Brown 2/	Brown 2/	Brown
Distillation temp.:					
10% evap. ° F.	153	148	146	147	147
50% evap.	214	212	215	214	214
90% evap.	248	246	251	249	249
Sum 10 + 50	367	360	361	361	361
Slope at 10 percent evap.	2.7	2.4	2.3	2.4	2.4
Reid vapor pressure lb.	6.6	6.6	6.6	6.7	6.7
Gum:					
Copper dish mg./100 ml.	.9	.8	1.4	1.0	1.1
Potential, 16 hr.	1.2	.9	1.0	1.0	1.0
Heat of combustion, net Btu/lb.	19,057	19,067	18,980	18,974	18,961
Aniline point ° F.	156.7	158.3	154.2	152.2	150.5
Gravity ° API	70.2	71.3	70.1	70.0	69.6
Aniline-gravity constant	11,004	11,287	10,809	10,654	10,475
Freezing point ° F.	< -76	< -76	< -76	< -76	< -76
Corrosion, copper strip	Neg.	Neg.	Neg.	No. 1	No. 1
Sulfur wt. percent	0.016	0.017	0.017	0.013	0.015
Viscosity, kinematic at 70° F. cs.	.674	.643	.634	.642	.616

1/ 1 sample brown. 2/ 1 sample purple.

TABLE 5. - Summarized data on Grade 115/145 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Number of fuels	19	17	19	6	7	9	12	14	17	17
Octane number:										
Aviation	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+
	0.59	0.55	0.59	0.59	0.69	0.58	0.59	0.64	0.71	0.68
Supercharged	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+	Iso+
	3.06	2.92	2.92	2.92	2.93	2.96	2.88	2.92	2.92	2.89
Performance number:										
Aviation	118	117	118	118	120	118	118	119	120	120
Supercharged	147	146	146	146	146	146	146	146	146	146
Tetraethyllead ml./gal.	4.42	4.52	4.47	4.53	4.52	4.55	4.56	4.51	4.51	4.48
Color	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple
Distillation temp.										
10% evap. ° F.	149	150	151	149	147	150	148	147	150	146
50% evap.	211	210	210	212	211	213	212	212	212	211
90% evap.	244	247	243	250	247	247	246	245	244	246
Sum 10 + 50	360	360	361	361	358	363	360	359	362	357
Slope at 10 percent evap.	2.3	2.3	2.0	2.5	2.5	2.5	2.4	2.5	2.6	2.5
Reid vapor pressure lb.	6.4	6.5	6.4	6.5	6.6	6.6	6.5	6.6	6.5	6.6
Gum:										
Copper dish mg./100 ml.	1.4	1.2	.9	1.0	1.2	.9	.9	1.0	1.0	.9
Potential, 16 hr.	-	-	-	.9	1.1	1.2	1.1	1.1	.8	.7
Heat of combustion,										
net Btu/lb.	19,235	19,261	19,182	19,043	19,087	19,042	19,040	18,995	18,997	18,995
Aniline point ° F.	156.9	156.0	159.0	159.8	161.6	156.1	153.0	156.8	156.8	154.7
Gravity ° API	70.5	70.5	71.1	71.0	71.4	70.3	70.1	70.5	70.5	70.6
Aniline-gravity constant	11,061	10,998	11,305	11,354	11,546	10,996	10,725	11,054	11,054	10,922
Freezing point ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1	No. 1
Sulfur wt. percent	0.012	0.020	0.015	0.010	0.011	0.017	0.016	0.017	0.014	0.014
Viscosity, kinematic at 70° F. cs.	.615	.612	.624	.647	.638	.651	.637	.633	.650	.622

TABLE 6. - Summarized data on aviation jet fuels

Inspection test	Grade JP-1		Grade JP-3								Referee JP-3 1951
	1951	1952	1951	1952	1953		1954	1955		1956	
Number of fuels	9	3	23	6	1/2		4	1/2		3	1
Gravity ° API	42.2	42.3	53.7	52.5	55.6,	50.7	56.5	55.3,	58.9	55.6	47.1
Distillation temp.:											
10% evap. ° F.	345	338	163	166	165,	194	160	142,	150	157	151
50% evap.	378	368	313	316	301,	340	265	220,	261	272	344
90% evap.	437	421	435	433	446,	426	421	445,	413	430	480
400° F. point percent evap.	-	-	-	-	-	-	84	71,	86	78.9	-
Reid vapor pressure lb.	-	-	5.9	6.0	5.7,	5.5	5.7	6.3,	5.5	5.6	6.9
Freezing point ° F.	<-76	<-76	<-76	<-76	<-76,	<-76	<-76	<-76,	<-76	<-76	<-76
Viscosity, kinematic, -30° F. cs.	8.29	8.59	2.91	-	-	3.26	2.15	1.8,	-	2/2.5	3.36
Water tolerance ml.	0.0	0.0	0.0	0.0	0.0,	0.0	0.0	0.0,	0.0	.2	0.0
Aniline point ° F.	132.8	-	134.5	123.9	132.9,	124	130.5	127.5,	135.0	132.0	107
Aniline-gravity constant	5,604	-	7,223	6,505	7,389,	6,287	7,373	7,051,	7,952	7,339	5,040
Bromine No. gm. Br/100 gm.	0.95	1.57	2.59	2.30	1.52,	1.54	1.06	0.4,	1.2	0.81	7.3
Sulfur											
Total wt. percent	0.079	0.057	0.085	0.081	0.077,	0.048	0.089	0.04,	0.08	0.063	0.35
Mercaptan	0.0009	0.0017	0.0008	0.0010	.003,	.001	.001	0.001,	0.003	0.0021	0.0005
Aromatic content vol. percent	14.3	14.3	11.3	14.7	12.3,	16.0	10.3	9.0,	9.7	9.3	25
Olefin content	-	-	-	-	-	-	.6	.6,	.6	1.3	-
Smoke point mm.	-	-	-	-	-	-	29.4	26,	29	29.7	-
Smoke volatility index	-	-	-	-	-	-	64.7	55.8,	65.1	62.7	-
Gum,											
Existent:											
Air-jet, 400° F. mg./100 ml.	1.4	1.7	1.7	0.9	0.7,	0.4	1.6	-	0.2	2/0.2	1.2
Steam-jet, 450° F.	-	-	2.2	-	-	.4	1.5	1,	-	1.1	1.8
16-hr. accelerated:											
Air-jet, 400° F.	1.5	1.5	4.1	5.9	1.5,	2.9	1.8	-	1.2	2/ .8	8.4
Steam-jet, 450° F.	-	-	3.7	-	-	2.4	1.9	1,	-	3.0	11.4
Heat of combustion, net Btu/lb.	18,556	18,551	18,717	18,642	18,716,	18,555	18,715	18,700,	18,773	18,716	18,484
Hydrogen-carbon ratio	0.1610	-	0.1649	-	-	0.1575	0.1680	0.16	0.175	0.168	0.1570

1/ As only 2 samples are represented, average values were not computed.
2/ Test on 1 sample.

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TABLE 6. - Summarized data on aviation jet fuels—Continued

Inspection test	Grade JP-4							Referee JP-4						Grade JP-5					
	1951		1952	1953	1954	1955	1956	1952	1953	1954	1955	1956		1953	1954		1955	1956	
Number of fuels	[1] 2		24	28	23	30	31	1	1	1	3	[1] 2		1	[1] 2		3	[1] 2	
Gravity °API	53.6,	55.1	50.5	51.8	51.5	52.2	52.4	45.6	45.4	48.1	48.4	47.8,	48.0	37.3	37.8,	41.0	39.8	37.7,	39.3
Distillation temp.:																			
10% evap. °F.	216,	193	222	220	216	219	217	238	240	244	229	227,	221	397	384,	395	392	389,	386
50% evap.	289,	297	332	324	319	318	317	348	349	361	357	351,	359	432	418,	424	428	418,	422
90% evap.	407,	440	430	421	425	412	409	455	461	457	469	460,	468	491	470,	480	485	468,	472
400° F. point percent evap.	-	-	-	-	82.5	85.0	85.0	-	-	72.0	68.9	69.5,	67	-	27.5,	16	17.0	25,	27
Reid vapor pressure lb.	2.5,	3.0	2.6	2.5	2.6	2.6	2.6	2.3	2.2	2.5	2.5	2.4,	2.7	0.5	0,	-	-	-	0
Freezing point °F.	<-82,	-78	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-67	<-67,	<-76	-54	<-40,	-59	<-40	-73,	<-40
Viscosity, kinematic, -30° F. cs.	2.51,	-	4.18	3.68	3.26	2.97	2.87	3.73	3.80	3.41	-	-	-	19.4	12.1,	13.36	13.20	12.0,	12.2
Water tolerance ml.	0.0,	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0,	0.0	0.0	0.0,	0.0	0.0	0.0,	0.0
Aniline point °F.	140,	137.9	133.9	134.8	133.8	135.5	134.7	110.8	106.5	131.4	134.9	129.5,	132.2	136	129,	146	144.4	134.2,	140.9
Aniline-gravity constant	7,504,	7,598	6,762	6,983	6,891	7,073	7,058	5,052	4,835	6,320	6,529	6,190,	6,346	5,073	4,876,	5,986	5,747	5,059,	5,537
Bromine No. gm. Br/100 gm.	0.96,	1.4	1.91	1.63	1.59	1.51	1.56	13.0	19.6	5.60	1.4	-	2.0	4.3	3.7,	0.80	3.10	4.5,	3.2
Sulfur																			
Total wt. percent	0.074,	0.119	0.075	0.074	0.080	0.065	0.054	0.301	0.265	0.177	0.199	0.155,	0.24	0.46	0.33,	0.075	0.167	0.26,	0.18
Mercaptan	.003,	0.0017	0.0010	0.0014	0.0016	0.0013	0.0013	.003	.002	.001	.001	.001,	0.001	0.003	0.001,	.001	0.0012	0.0005,	<0.001
Aromatic content vol. percent	12.2,	10.0	11.9	11.9	11.3	10.8	10.5	20.4	20.3	16.4	14.2	17.2,	14.8	8.3	20.3,	15.13	12.0	10.0,	12.8
Olefin content	-	-	-	-	1.3	1.3	1.3	-	-	2.3	.9	.6,	1.06	-	.9,	.87	3.1	-	1.4
Smoke point mm.	-	-	-	-	28.7	30.3	29.6	-	-	23	23.3	22.5,	24	-	21,	21	22.0	20,	21
Smoke volatility index	-	-	-	-	63.4	66.0	64.9	-	-	53.2	52.2	51.7,	52.1	-	33,	27.7	29.1	30.5,	32.3
Gum																			
Existent:																			
Air-jet, 400° F. mg./100 ml.	1.4,	0.0	1.2	1.3	1.3	-	-	3.8	2.8	1.4	-	-	-	3	2,	-	-	-	-
Steam-jet, 450° F.	3.2,	.4	-	.7	.6	0.9	0.8	-	-	1.0	1.0	0.6,	1	2	1,	1.0	0.9	1.0,	0.5
16-hr. accelerated:																			
Air-jet, 400° F.	6.2,	1.0	3.3	2.9	-	-	-	19.0	13.4	14.5	-	-	-	5	2,	-	-	-	-
Steam-jet	3.2,	.3	-	1.7	2.5	2.4	2.2	-	-	9.3	5.6	5.5,	3	4	1,	2.0	1.6	3.0,	1
Heat of combustion, net Btu/lb.	18,756,	18,735	18,671	18,714	18,678	18,674	18,685	18,452	18,467	18,582	18,613	18,580,	18,586	18,474	18,391,	18,569	18,525	18,425,	18,498
Hydrogen-carbon ratio	0.1605,	0.1709	-	0.1649	0.1635	0.156	0.165	-	-	0.162	[2] 0.137	-	-	0.159	0.157,	0.151	0.148	-	0.158

[1] As only 2 samples are represented, average values were not computed.
[2] Test on 1 sample.

milliliters tetraethyllead above 100), performance numbers (for grades 100/130, 108/135, and 115/145), tetraethyllead content, distillation characteristics, Reid vapor pressure, copper-dish gum, potential gum, visible lead precipitate, water tolerance, net heat of combustion, aniline point, gravity, freezing point, sulfur content, kinematic viscosity at 70° F., color of fuel, copper-strip corrosion, and acidity of distillation residue. The performance numbers have been recorded to the nearest whole unit as the rating methods are considered accurate only to that extent. ASTM or FS number designations 2/ are used with the test names to indicate the test procedures in most of the column headings of tables 7 through 11. An exception to the method is indicated by a footnote. Also listed are aniline-gravity constants as reported. Average values of the tests are given at the foot of each table for the number of samples indicated.

The results of two tests—color and copper-strip corrosion—are given in the summary tables (1-5) rather than in columns in the detailed analysis tables. All the results of the test for acidity of distillation were reported "negative" but are not recorded in tables of this survey. Some of the samples were tested by the respective contributors for corrosion and acidity of distillation residue by equivalent company methods.

The analyses of aviation gasolines for military purposes only are listed separately. The averages of the tests, however, include the values of gasolines designated for both commercial and military use and are so indicated by footnotes.

TRENDS OF AVIATION GASOLINE CHARACTERISTICS

Figures 1 through 5 illustrate trends of certain distillation values, Reid vapor pressure, tetraethyllead content, kinematic viscosity at 70° F., and slope at 10 percent for the 5 grades of commercial aviation gasoline. Minimum and maximum values in the figures were obtained from the detailed tables in the series of reports. As data on grade 108/135 fuels were not included in the survey reports until 1952, the plots in figure 4, on comparable-size charts, are shown only for the last 5 years. Graphs showing trends of octane and performance numbers have not been prepared because no variations exceeding the reproducibility of the test methods were found.

2/ American Society for Testing Materials, ASTM Standards on Petroleum Products and Lubricants (With Related Information): Philadelphia, 1955, 954 pp.; ASTM Manual of Engine Test Methods for Rating Fuels, 1952, Philadelphia, 1952, 342 pp., 1953 Supplement to ASTM Manual of Engine Test Methods for Rating Fuels, 1953, 46 pp.

Federal Specification VV-L-791e, May 21, 1953, Lubricants, Liquid Fuels and Related Products: Methods of Inspection, Sampling, and Testing, Federal Standard Stock Catalog, sec. IV, part 5.

INSPECTION TEST DATA OF AVIATION JET FUELS

Analyses of 3 samples of grade JP-3 jet fuel, 31 samples of JP-4, 2 samples of JP-4 referee jet fuel, and 2 samples of JP-5 jet fuel are shown in table 12. Each complete analysis consists of data for 20 tests: Gravity, distillation, Reid vapor pressure, Tag closed-cup flash point, freezing point, color, viscosity at -30° F. in centistokes, water tolerance, aniline point, bromine number, total and mercaptan sulfur in weight percents, copper-strip corrosion, aromatic and olefin contents, smoke point, existent gum by steam-jet at 450° F., 16-hour accelerated (potential) gum by steam-jet at 450° F., net heat of combustion, and hydrogen-carbon ratio. These data were supplied by 17 manufacturers of aviation jet fuel. The tests were conducted in company laboratories by procedures approved by the American Society for Testing Materials, [3] and in accordance with military specifications MIL-F-5624C and MIL-F-5161C, and amendments. [4] Average values are shown for grades JP-3 and JP-4 jet fuels in table 12. Averages are not given if the samples tested are too few, or for properties such as color and flash point which are not considered additive. Table 6 presents a summary of data on aviation jet fuels tested since 1951.

Results of 2 tests no longer are tabulated—existent gum by air jet at 400° F. and 16-hour accelerated (potential) gum by air jet at 400° F.—as these determinations generally have been superseded by procedures using steam jet at 450° F. Figures are computed for aniline-gravity constant and smoke volatility index. Most of the figures for net heat of combustion are computed values from a formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials. Values determined by methods other than indicated in the headings of table 12 are shown by footnotes.

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[3] See footnote 2.

[4] Military Specification, Fuel, Aircraft Turbine and Jet Engine, Grades JP-3, JP-4, and JP-5, MIL-F-5624C, May 18, 1955, 6 pp., and Amendment 1, Mar. 8, 1956; Military Specification, Fuel, Referee, Aircraft Turbine and Jet Engine, MIL-F-5161C, Dec. 4, 1953, 5 pp., and Amendment 1, Jan. 15, 1954.

LIST OF NATIONAL AVIATION-FUEL-SURVEY REPORTS

Author	Production date	Report No.	Published	Pages
In cooperation with the Coordinating Research Council, Inc.				
Holliman, W. C. & others	Mar. 1947	RI 4273	May 1948	16
Do.	July 1947	RI 4353	July 1948	16
Do.	Jan. 1948	RI 4424	Nov. 1948	16
Do.	July 1948	RI 4435	Nov. 1948	17
Do.	Jan. 1949	RI 4529	May 1949	17
Blade, O. C.	Oct. 1949	RI 4664	Mar. 1950	14
In cooperation with the American Petroleum Institute				
Blade, O. C.	Oct. 1950	RI 4789	Mar. 1951	11
Do.	Oct. 1951	RI 4889	May 1952	13
Do.	1952	RI 4982	May 1953	15
Do.	1953	RI 5036	Feb. 1954	15
Do.	1954	RI 5132	Apr. 1955	15
Do.	1955	IC 7747	Mar. 1956	15
Do.	1956	This report		

TABLE 7. - Grade 80/87 aviation gasoline: Inspection data furnished by participating companies for their products, 1956

Item	Octane number		Tetraethyllead, ml./gal.	Distillation, ASTM Method D86															Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper-dish gum, ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg./100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, ° F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS 1411, ° F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes
				Temperature (corrected to sea level) ° F.													Percent														
				Percent evaporated												Sum															
	Aviation, ASTM D614	Supercharged, ASTM D909		IBP	5	10	15	20	30	40	50	70	90	95	EP	10+50	Res.	Loss													
	Commercial aviation gasolines																														
1	80.3	-	0.69	124	146	153	156	160	167	173	179	199	229	255	302	332	0.7	1.3	1.0	6.1	1	0.2	0.0	0.0	18,710	111	64.8	7,193	-85	0.007	0.53
2	84.0	87.5	.50	116	146	154	160	166	176	186	197	213	231	246	314	351	1.0	1.0	1.4	5.9	1.5	.2	.0	.0	18,990	153.0	71.7	10,970	<-76	.0004	.58
3	81.8	88.7	.42	117	138	150	157	162	173	183	192	209	229	242	276	342	1.0	1.0	1.9	5.8	-	.6	.0	.0	18,845	131.9	65.9	8,692	<-76	.01	-
4	81.2	87.8	.49	106	131	144	151	157	168	174	183	198	225	244	290	327	1.0	1.0	2.0	6.5	-	1.8	.1	.0	18,904	138.8	68.5	9,508	<-76	.02	-
5	81.7	87.7	.00	115	137	149	157	164	177	189	199	216	231	242	296	348	1.0	.5	2.0	6.8	-	.6	.1	.5	18,988	153.1	71.4	10,931	<-90	.001	-
6	80.5	87.5	.41	111	129	146	153	158	167	177	185	212	241	285	332	331	.9	1.1	2.4	6.6	1.0	.8	.0	.0	18,857	133.0	66.7	8,871	<-80	.020	.59
7	84.0	89.3	.5	108	136	150	160	168	184	197	208	224	246	264	302	358	.6	.9	2.4	6.8	2	1	.0	.0	18,767	121	64.3	7,780	<-76	.006	.61
8	82.9	90.0	.48	120	143	148	151	154	161	168	175	193	220	237	265	323	1.0	1.0	.8	6.3	1.0	1.0	.0	.0	18,872	133.3	67.9	9,051	<-76	01	.583
9	83	89	.50	118	141	152	160	168	179	195	205	216	237	253	302	357	1.0	1.0	1.9	6.6	1	1	.0	.5	18,830	130	65.4	8,502	<-76	.004	.69
10	84.0	87.3	.49	104	130	149	160	170	184	200	211	227	245	280	315	360	.5	.8	3.0	6.1	1	3	.0	.0	18,837	130.6	65.7	8,580	<-76	.005	-
11	82.4	87.0	.49	112	133	143	148	150	159	168	178	196	216	236	308	321	.3	.7	1.5	6.9	.4	.8	.2	.0	19,015	154.0	75.3	11,596	<-76	.010	.53
12 2/	81.4	88.0	.42	120	142	150	158	165	178	190	201	217	241	252	288	351	1.0	1.0	1.6	6.1	1	1	.0	.0	18,896	138.6	67.6	9,369	<-76	.005	.61
13 2/	80.2	-	.00	101	125	137	147	155	170	187	201	217	236	252	296	338	.8	.7	2.2	6.9	2	.8	.4	.0	3/ 19,069	151.5	71.4	10,817	<-76	.029	-
14 2/	86.3	89.3	.50	120	137	152	160	168	182	196	204	216	242	264	282	356	1.0	1.0	2.3	6.5	.4	.6	.0	.0	19,003	157.3	72.3	11,373	<-76	.03	-
15 2/	83.5	87.5	.46	112	136	144	149	154	164	174	184	206	236	256	300	332	1.0	.0	1.3	6.7	1	1	.0	.0	3/ 18,910	144	71.4	10,281	<-76	.010	.57
16 2/	82.7	87.3	.00	122	144	155	163	170	184	195	204	219	237	265	311	359	1.0	.0	1.9	6.2	-	.0	.0	.0	18,985	154.0	70.6	10,872	<-100	.001	-
17 2/	81.0	88.0	.42	106	139	148	155	162	176	187	195	203	217	233	276	343	.9	1.0	1.6	6.9	.4	.6	.0	.0	3/ 18,880	126	66.1	8,328	<-76	.015	.56
18 2/	81.6	88.0	.46	115	136	145	150	154	164	175	184	201	220	230	288	329	1.0	1.0	1.4	6.2	.3	.4	.0	.0	18,868	131.2	68.5	8,987	<-76	.010	.57
19 2/	80.5	87.2	.49	116	136	150	162	172	182	197	207	225	250	271	302	357	1.0	1.0	2.6	6.8	-	2	.0	.0	18,855	135.6	65.4	8,868	<-76	.03	.67
20 2/	80.0	88.0	.45	114	137	148	155	162	172	181	189	204	220	232	275	337	1.0	1.0	1.8	6.5	1	1	.0	.0	18,843	130.5	66.4	8,665	<-76	.01	.580
21 2/	80.5	88.0	.43	116	132	143	148	153	166	176	187	205	222	233	260	330	1.0	1.0	1.6	6.8	.0	.4	.0	.0	18,820	126.0	66.6	8,392	<-76	.01	.57
22 2/	81.0	87.4	.38	116	139	148	156	162	172	182	190	209	232	243	283	338	1.0	1.0	1.7	6.6	1	1	.0	.0	18,799	122.6	66.4	8,141	<-76	.01	.55
Average 22 samples	82.0	88.0	.41	114	137	148	155	162	173	184	194	210	232	251	294	342	.9	.9	1.8	6.5	.9	.9	.0	.0	18,888	136.7	68.2	9,323	<-76	.012	.586
	Military aviation gasolines																														
Average 4/ 11 samples	81.7	87.9	0.36	114	137	147	155	162	174	185	195	211	232	248	287	342	1.0	0.8	1.8	6.6	0.8	0.8	0.0	0.0	18,903	137.9	68.4	9,432	<-76	0.015	0.585

TABLE 8. - Grade 91/96 aviation gasoline: Inspection data furnished by participating companies for their products, 1956.

Commercial aviation gasolines

23	98.0	99.4	4.0	112	140	154	164	172	186	198	207	223	246	262	299	361	0.5	1.0	2.4	6.3	1	1	0.0	0.0	18,801	126	64.7	8,152	<-76	0.006	0.62
24	92.8	98.9	2.87	129	146	149	153	155	162	169	176	195	224	240	277	325	1.0	1.0	.7	6.0	1.0	1.0	.0	.0	18,873	133.5	67.7	9,038	<-76	.01	.588
25	94	99	4.0	116	142	146	154	163	187	191	203	218	237	253	292	349	1.0	1.0	1.2	6.8	2	.0	.0	.5	18,798	123.8	65.6	8,121	<-76	.011	.60
26	95.0	98.0	3.81	104	136	153	163	174	194	203	211	224	247	275	304	364	.4	.9	2.7	5.9	1	4	.0	.0	18,783	123.4	64.5	7,959	<-76	.007	-
27	92.4	98.6	4.12	113	135	146	153	158	168	178	187	195	226	246	275	333	1.0	1.0	1.8	6.3	-	.5	.0	.0	18,785	124.4	64.3	7,999	<-76	.02	-
28	94.9	98.2	3.99	114	135	143	149	153	160	171	180	197	217	228	287	323	.7	.5	1.4	6.8	.4	.8	.0	.0	18,953	143.6	71.6	10,282	<-76	.013	.52
29	92.0	98.0	4.00	116	133	146	152	158	168	181	193	215	251	290	311	339	1.0	1.0	1.9	6.5	-	< .5	<.5	.0	18,756	118	65.3	7,705	<-76	.03	-
30	93.5	99.5	3.89	115	132	148	155	160	170	176	186	214	240	280	331	334	.8	1.2	2.3	6.9	1.0	.9	.0	.0	18,834	129.6	66.0	8,554	<-80	.010	.59
31	96.0	99.2	3.82	114	133	145	152	158	171	182	192	209	228	240	297	337	1.0	1.0	1.9	6.7	-	.8	.1	.5	18,959	147.4	70.4	10,377	<-90	.008	-
32 2/	94.2	99.6	3.58	124	137	147	155	161	173	184	193	210	235	254	307	340	1.0	1.0	1.8	6.9	-	.2	.0	.0	18,893	136.4	68.3	9,316	<-100	.002	-
33 2/	97.5	98.7	3.86	118	139	151	161	167	180	194	204	218	233	251	282	355	1.0	1.0	2.2	6.3	.4	.8	.0	.0	18,991	155.0	71.6	11,098	<-76	.03	-
34 2/	95.6	98.1	2.98	104	129	140	148	156	169	187	202	221	244	269	326	342	1.3	.7	1.9	6.7	2	2.0	2.0	.0	3/19,066	151.0	71.1	10,736	<-76	.028	-
35 2/	92.0	98.5	2.92	107	134	144	150	155	168	181	190	201	215	233	274	334	.8	1.0	1.6	7.0	.8	.6	.0	.0	3/18,907	132	67.1	8,857	<-76	.018	.566
36 2/	93.0	99.2	2.92	108	137	145	151	156	166	176	184	203	224	240	291	329	1.0	1.0	1.4	6.5	3.1	.6	.0	.0	18,907	138.0	69.1	9,536	<-76	.010	.60
37 2/	91.5	98.6	3.95	116	137	153	165	174	187	198	207	222	247	268	296	360	1.0	1.0	2.8	6.6	-	2	.0	.0	18,839	133.8	64.7	8,657	<-76	.03	.66
38 2/	94.0	99.0	3.82	124	135	147	151	159	166	172	181	202	236	255	301	328	1.0	1.0	1.6	6.1	1	1	.0	<1	18,848	129.3	67.6	8,741	<-76	.013	-
39 2/	96.0	99.0	3.95	116	138	144	150	154	162	172	182	200	230	248	292	326	1.0	.0	1.2	6.7	1	1	.0	.0	3/18,850	141	70.7	9,968	<-76	.010	.57
40 2/	92.0	98.5	3.95	114	136	147	154	161	176	192	202	210	220	242	262	349	1.0	.0	1.8	6.5	1	.2	.0	.0	18,759	121.0	63.6	7,696	<-76	.01	.60
41 2/	91.0	98.5	3.88	114	137	147	154	159	168	176	184	197	214	225	252	331	1.0	1.0	1.7	6.6	1	1	.0	.0	18,750	118.5	64.2	7,608	<-76	.01	.577
42 2/	91.2	98.4	3.98	118	136	146	153	159	169	178	186	206	231	245	276	332	1.0	1.0	1.7	6.8	1	1	.0	.0	18,779	119.8	66.2	7,931	<-76	.02	.53
43 2/	93.6	99.0	3.90	112	137	145	151	159	171	185	197	215	237	249	280	342	1.0	1.0	1.4	6.4	1	1	.0	.0	18,894	138.2	67.6	9,342	<-76	.007	.59
Average 21 samples	93.8	98.8	3.72	115	136	147	154	161	172	183	193	209	232	252	291	340	.9	.9	1.8	6.5	1.2	1.0	.1	.0	18,858	132.6	67.2	8,911	<-76	.014	.585

Military aviation gasolines

Average 4/ 12 samples	93.5	98.8	3.64	115	136	146	154	160	171	183	193	209	231	248	287	339	1.0	0.8	1.8	6.6	1.2	1.0	0.2	0.0	18,874	134.5	67.7	9,106	<-76	0.016	0.587

1/ Unless otherwise indicated, the figures for net heat of combustion are values computed from the formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials: $Q = 17,608 + 0.2054(AG) - 7.24\ (10^{-6})(AG)^2$ for sulfur-free gasoline, where AG is the aniline-gravity constant. Correct for sulfur content by the formula: $Q' = Q\ [1 - 0.01\ (\text{percent S})] + 43.7\ (\text{percent S})$.

2/ Fuel for commercial and military use. 3/ Determined value; ASTM D240 (proposed revision), a company modified method, or FS 2501.2.

4/ The samples represented include those tabulated with commercial fuels which are indicated by footnote 2 in the same grade.

TABLE 9. - Grade 100/130 aviation gasoline: Inspection data furnished by participating companies for their products, 1956

Item	Knock value				Tetraethyllead, ml./gal.	Distillation, ASTM Method D86															Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper-dish gum, ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg./100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, °F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS1411, °F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes
	TEL in isooctane ml./gal.		Performance number			Temperature (corrected to sea level) °F.												Sum	Percent														
						Percent evaporated																											
	Aviation, ASTM D614	Supercharged, ASTM D909	Aviation	Supercharged		IBP	5	10	15	20	30	40	50	70	90	95	EP	10+50	Res.	Loss													
Commercial aviation gasolines																																	
44	0.05	1.32	102	131	4.00	115	132	141	147	153	157	167	179	203	237	271	334	320	0.7	0.8	1.5	6.7	0.6	1.0	0.2	0.0	18,919	139.6	69.7	9,730	< -76	0.015	0.56
45	.01	1.3	100	130	2.97	108	136	146	149	160	171	183	196	212	234	249	296	342	1.0	.5	1.3	6.8	-	.6	.0	.0	2/18,745	118.6	64.7	7,673	<-148	.013	.60
46	.10	1.31	104	130	2.99	104	128	143	150	162	200	214	230	255	261	290	329	373	1.0	1.0	2.2	6.9	2.5	1.0	.2	.0	18,937	146.5	68.5	10,035	< -76	.022	.620
47	.19	1.36	107	131	4.52	107	132	145	154	163	178	192	203	219	235	252	305	348	1.0	1.0	2.2	6.5	-	.7	.0	.0	18,969	151.8	69.6	10,565	< -76	.01	-
48	.03	1.28	101	130	3.98	114	133	146	154	161	170	177	186	198	228	250	310	332	.9	1.1	2.1	6.5	1	1	.0	.0	18,932	145.2	68.7	9,975	< -80	.03	.66
49	.54	1.35	117	131	3.89	114	139	156	162	176	197	209	216	226	240	259	282	372	1.0	1.0	2.3	6.3	.2	.6	.0	.0	19,024	165.5	72.5	11,999	< -76	.04	-
50	.26	1.34	109	131	2.97	103	127	144	153	164	187	204	215	226	243	261	321	359	1.5	1.0	2.6	6.6	1	.7	1.0	.5	2/19,080	161.5	71.9	11,612	< -76	.030	-
51	.04	1.36	102	131	3.50	105	123	142	153	162	183	202	217	237	265	290	309	359	1.0	1.0	3.0	6.5	-	<.5	<.5	.0	18,735	118	63.3	7,469	< -76	.03	-
52	.19	1.28	107	130	3.95	112	136	148	156	166	180	192	202	228	254	285	330	350	.8	1.2	2.0	7.0	1.1	1.0	.0	.0	18,980	154.4	70.0	10,808	< -80	.017	.61
53	.40	1.30	113	130	4.0	106	136	152	163	173	192	205	212	226	242	260	295	364	1.0	1.0	2.7	6.8	2	1	.0	.0	18,951	149	68.7	10,236	< -76	.008	.64
54	.32	1.30	111	130	3.98	105	132	142	149	157	173	184	196	213	232	249	280	338	1.0	1.0	1.7	6.8	1.0	1.0	.0	.0	18,992	152.8	72.1	11,017	< -76	.01	.598
55	.22	1.36	108	131	3.98	112	140	146	168	180	191	211	219	230	252	271	308	365	1.0	1.0	2.8	6.0	1	.0	.0	.5	18,949	148.4	68.7	10,195	< -76	.009	.66
56	.36	1.41	112	132	3.74	106	136	155	166	178	195	207	215	221	239	264	300	370	.7	.9	3.0	6.4	4	1	.0	.0	18,950	149.0	68.6	10,221	< -76	.007	-
57 3/	.30	1.43	111	132	3.90	112	139	152	164	175	196	211	219	232	251	273	328	371	1.1	.9	2.5	6.9	1	.0	.0	.0	18,988	159.7	68.5	10,939	< -76	.002	-
58 3/	.30	1.30	111	130	3.73	110	131	141	151	159	176	198	215	229	253	265	292	356	1.0	1.0	2.0	6.3	1	1	.0	.0	19,007	160.2	71.0	11,374	< -76	.011	.62
59 3/	.01	1.30	100	130	3.90	110	132	147	157	166	180	190	200	214	230	245	290	347	1.0	1.0	2.5	6.8	1	1	.0	.0	18,761	119.0	65.0	7,735	< -76	.02	.54
60 3/	.09	1.31	104	130	3.89	113	134	143	148	154	164	177	191	224	257	276	318	334	1.0	.0	1.4	6.5	.0	.2	.0	.0	18,807	125.0	65.9	8,238	< -76	.01	.57
61 3/	.10	1.30	104	130	3.89	108	129	144	154	162	180	194	206	225	256	268	282	350	1.0	1.0	2.5	6.5	1	1	.0	.0	18,802	126.4	64.7	8,178	< -76	.01	.588
62 3/	.28	1.36	110	131	3.95	108	136	146	152	160	172	184	196	218	248	268	312	342	1.0	.0	1.6	6.7	1	1	.0	.0	2/18,800	140	68.7	9,618	< -76	.010	.60
63 3/	.24	1.33	108	131	3.91	116	125	144	150	159	173	185	200	215	244	265	309	344	1.0	1.0	2.5	6.4	1	1	.0	<1	18,830	125.9	67.6	8,511	< -76	.010	-
64 3/	.23	1.29	108	130	2.97	114	138	153	167	178	193	205	216	233	253	280	323	369	1.0	1.0	2.9	6.8	-	2	.0	.0	19,007	161.8	70.9	11,472	< -76	.03	.69
65 3/	.20	1.32	107	131	4.53	114	139	155	168	178	195	206	216	234	255	281	323	371	1.0	1.0	2.9	6.5	-	2	.0	.0	18,971	155.0	68.9	10,680	< -76	.03	.68
66 3/	.04	1.38	102	131	2.83	105	132	145	154	162	178	195	208	223	238	256	324	353	1.0	1.0	2.2	6.5	.9	.4	.0	.0	18,911	140.3	68.4	9,596	< -76	.012	.58
67 3/	.04	1.32	102	131	2.95	107	127	142	149	158	176	196	212	231	256	279	318	354	1.0	1.0	2.2	7.0	1.0	.6	.0	.0	19,031	138	68.2	9,411	< -76	.015	.613
68 3/	.14	1.38	105	131	3.65	111	137	152	164	174	192	204	214	230	255	271	324	366	1.0	1.0	2.7	6.6	-	.0	.0	.0	18,852	133.7	65.6	8,771	<-100	.006	-
69 3/	.30	1.45	111	132	3.95	113	129	143	154	163	180	194	205	221	236	247	306	348	1.0	1.0	2.5	6.7	-	.4	.1	.5	19,008	158.4	72.1	11,420	< -90	.009	-
Average 26 samples	.19	1.34	107	131	3.71	110	133	147	156	166	182	196	207	224	246	266	310	354	1.0	.9	2.3	6.6	1.2	.8	.1	.1	18,921	144.0	68.6	9,878	< -76	.016	.613
Military aviation gasolines																																	
70	0.44	1.29	114	130	4.55	106	128	145	156	162	175	192	207	222	255	272	327	352	1.0	1.0	2.8	6.8	1.4	2.6	0.0	0.0	19,020	161.0	72.8	11,721	< -76	0.004	0.611
71	.00	1.28	100	130	4.56	112	134	143	148	152	161	172	183	208	262	288	319	326	1.0	1.0	1.4	6.8	3	1	.0	.0	18,931	144	68.8	9,907	< -76	.010	.66
72	.05	1.36	102	130	4.54	104	132	145	152	159	176	192	206	224	252	276	312	351	1.0	1.0	2.0	6.3	2.7	1.7	.4	.0	2/18,791	123.8	65.2	8,072	< -76	.040	.59
73	.3	1.3	111	130	4.54	108	120	140	150	160	178	196	208	222	242	270	310	348	.8	1.0	3.0	6.5	1.6	1.4	.2	.0	19,020	161.0	73.2	11,785	< -76	.022	.622
74	.39	1.28	113	130	4.59	104	132	145	156	167	185	200	211	224	245	265	320	356	1.0	1.0	2.4	6.7	.0	1.6	.6	.0	19,006	159.8	71.4	11,410	< -76	.02	-
75	.44	1.38	114	131	4.56	114	138	156	168	176	194	206	214	222	234	252	288	370	1.0	1.0	3.0	6.4	.6	1.0	.0	.0	19,018	163.5	71.9	11,756	< -76	.03	-
76	.20	1.30	107	130	4.53	102	130	143	151	159	179	199	210	225	244	260	329	353	1.0	1.0	2.1	6.6	2	.6	1.4	.0	2/19,074	160.0	71.6	11,456	< -76	.030	-
77	.05	1.29	102	130	4.50	105	123	142	154	166	185	202	214	229	256	283	302	356	1.0	1.0	3.1	6.8	-	1.9	<.5	.0	18,760	121	64.0	7,744	< -76	.03	-
Average 4/ 21 samples	.20	1.33	107	131	4.02	109	132	146	156	164	180	195	207	224	249	269	312	353	1.0	.9	2.4	6.6	1.2	1.1	.1	.0	18,924	144.6	68.8	9,948	< -76	.017	.613

TABLE 10. - Grade 108/135 aviation gasoline: Inspection data furnished by participating companies for their products, 1956

Item	Aviation, ASTM D614	Supercharged, ASTM D909	Aviation	Supercharged	Tetraethyllead, ml./gal.	IBP	5	10	15	20	30	40	50	70	90	95	EP	10+50	Res.	Loss	Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper-dish gum, ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg./100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, °F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS1411, °F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes
Commercial aviation gasolines																																	
78	0.50	1.90	116	137	2.84	116	144	158	167	176	195	209	217	228	245	272	330	375	1.0	1.0	2.3	6.6	1	1	0.0	0.0	19,022	165.2	71.4	11,795	< -76	0.012	0.64
79	.29	1.86	110	137	2.84	101	131	143	152	161	180	200	212	225	244	270	326	355	1.0	1.0	2.1	6.9	1.1	2.0	.0	.0	19,005	158.1	71.8	11,351	< -76	.012	.61
80	.37	1.72	113	135	2.95	113	138	152	167	178	193	205	216	233	253	280	324	368	1.0	1.0	2.9	6.8	-	2	.0	.0	19,016	164.3	71.4	11,731	< -76	.03	.68
81	.39	1.77	113	136	2.85	112	132	148	155	165	180	194	206	230	252	283	331	354	.9	1.1	2.3	6.8	1.0	.7	.0	.0	18,980	154.0	70.3	10,826	< -80	.019	.61
82	.49	1.73	116	136	2.92	108	124	149	157	162	187	203	215	226	250	270	318	364	1.0	1.0	3.3	6.4	1	1	.0	<1	18,964	150.3	69.8	10,491	< -76	.014	-

83	.27	1.78	110	136	3.0	106	130	140	147	154	167	182	202	228	252	274	306	342	1.0	.0	1.7	6.5	.0	.0	.0	.0	18,882	135.6	67.7	9,180	< -76	.01	.60
84	.25	1.68	109	135	2.96	111	132	147	158	170	191	208	218	229	247	261	296	365	1.0	1.0	2.6	6.4	1	1	.0	.0	18,906	140.9	67.6	9,525	< -76	.01	.603
85	.25	1.70	109	135	2.93	103	127	142	151	163	202	216	232	257	264	292	332	374	1.0	1.0	2.4	6.5	2.5	1.0	.2	.0	18,910	141.8	67.8	9,614	< -76	.022	.615
86	.31	1.72	111	135	2.98	103	132	143	152	159	176	192	205	219	236	252	299	348	.7	.8	2.0	7.0	-	.6	.0	.0	2/18,933	145.4	69.1	10,047	<-148	.006	.57
87 3/	.26	1.90	109	137	2.95	106	129	144	154	164	185	204	217	229	246	264	310	361	1.0	1.0	2.5	7.0	1.0	.4	.0	.0	2/18,993	149	69.1	10,296	< -76	.016	.62
Average	.34	1.78	112	136	2.92	108	132	147	156	165	186	201	214	230	249	272	317	361	1.0	.9	2.4	6.7	1.1	1.0	.0	.0	18,961	150.5	69.6	10,475	< -76	.015	.616

10 samples

Military aviation gasolines
(See item 87)

TABLE 11. - Grade 115/145 aviation gasoline: Inspection data furnished by participating companies for their products, 1956

Commercial aviation gasolines

88	1.00	3.00	126	147	4.5	107	137	155	166	175	193	206	215	227	243	256	314	370	0.5	1.0	2.9	6.1	1	0.0	0.0	0.0	19,022	165	71.4	11,781	<-76	0.008	0.68
89	.51	2.78	116	145	4.45	108	126	142	152	164	177	195	207	224	244	267	332	349	.8	1.2	2.6	6.7	1	1	.0	.0	19,012	161.2	71.9	11,590	<-80	.03	.68
90	.51	2.82	116	145	4.25	104	130	146	160	175	194	211	221	230	251	264	286	367	1.0	1.0	3.0	6.7	1	1	.0	.0	18,902	140.5	67.4	9,470	<-76	.01	.617
91	.58	2.85	118	146	4.47	111	128	139	145	150	159	168	179	208	237	256	318	318	.5	1.0	1.7	6.8	.4	.9	.2	.0	18,990	151.9	72.6	11,028	<-76	.017	.55
92 3/	.52	2.84	116	145	4.58	105	129	145	152	159	175	192	203	219	234	253	306	348	1.0	.5	2.3	6.9	-	.8	.0	.0	2/19,010	147.2	69.3	10,201	<-148	.011	.59
93 3/	.50	2.81	116	145	4.50	110	127	145	159	171	189	203	215	233	253	274	330	360	1.0	1.0	3.2	6.6	1	1	.0	.0	18,936	145.2	69.0	10,019	<-76	.02	.60
94 3/	.79	2.78	122	145	4.42	108	130	146	160	170	183	194	206	230	250	280	331	352	.8	1.2	3.0	7.0	1.0	.8	.0	.0	19,012	159.8	72.1	11,522	<-80	.011	.60
95 3/	.84	2.92	123	146	4.50	106	130	144	156	165	184	200	212	226	250	268	314	356	1.0	.0	2.6	6.7	1	1	.0	.0	2/19,030	157	71.0	11,147	<-76	.010	.62
96 3/	.76	2.86	121	146	4.47	111	126	147	158	170	187	203	215	226	247	270	315	362	1.0	1.0	3.2	6.5	1	1	.0	<1	18,958	148.5	69.9	10,380	<-76	.013	-
97 3/	.57	2.80	117	145	4.56	108	130	144	151	163	181	198	212	228	253	293	332	356	1.0	1.0	2.1	6.5	2.4	1.0	.2	.0	18,956	149.4	69.3	10,353	<-76	.019	.618
98 3/	.50	2.83	116	145	4.40	100	128	143	155	164	183	201	213	227	245	280	322	356	1.0	1.0	2.7	6.5	.4	.8	.0	.0	19,004	158.9	71.3	11,330	<-76	.010	.61
99 3/	.50	3.0	116	147	4.53	112	132	144	152	164	184	204	216	226	245	269	320	360	1.0	1.0	2.0	7.0	.6	.4	.0	.0	2/19,022	150	70.0	10,500	<-76	.019	.609
100 3/	.52	2.91	116	146	4.54	114	132	140	146	152	168	186	202	222	248	268	320	342	1.0	.0	1.4	6.5	.0	.3	.0	.0	18,942	145.9	69.2	10,096	<-76	.01	.61
101 3/	.82	2.86	123	146	4.54	105	126	142	151	162	185	204	215	226	242	262	324	357	.9	.6	2.5	6.7	.0	1.0	.3	.5	2/19,083	165.0	72.3	11,930	<-76	.029	-
102 3/	1.04	3.00	126	147	4.50	106	133	150	163	175	197	210	220	231	250	273	326	370	1.1	.9	3.0	6.8	1	.0	.0	.0	19,010	160.9	71.0	11,424	<-76	.002	-
103 3/	.80	2.93	122	146	4.39	112	140	154	164	174	195	210	218	227	243	262	321	372	1.0	1.0	2.4	6.7	1	1	.0	.0	19,027	166.1	71.7	11,909	<-76	.009	.64
104 3/	.84	3.06	123	147	4.50	108	141	158	170	180	190	211	219	230	247	277	318	377	1.0	1.0	2.9	6.0	1	.0	.0	.5	18,996	158	70.3	11,107	<-76	.009	.68
Average	.68	2.89	120	146	4.48	108	131	146	156	167	184	200	211	226	246	269	319	357	.9	.8	2.5	6.6	.9	.7	.0	.1	18,995	154.7	70.6	10,922	<-76	.014	.622

17 samples

Military aviation gasolines

105	1.00	2.80	126	145	4.56	101	130	139	148	153	170	190	204	217	235	250	280	343	1.0	1.0	1.8	6.9	3.2	2.4	0.0	0.0	19,030	163.8	73.5	12,039	<-76	0.01	0.665
106	.80	3.00	122	147	4.55	112	139	155	172	182	198	212	219	228	241	259	316	374	.8	.9	3.3	6.0	1	3	.0	.0	18,997	159.1	70.0	11,137	<-76	.001	-
107	.8	2.81	122	145	4.56	110	127	152	162	170	188	206	216	226	240	260	306	368	.8	1.0	3.5	6.4	1.2	1.6	.4	.0	19,024	165.0	72.1	11,897	<-76	.02	.626
108	.59	2.78	118	145	4.54	100	132	145	153	162	183	199	208	217	229	238	272	353	1.0	1.0	2.1	6.9	2.5	1.7	.0	.0	2/18,878	150.1	70.5	10,582	<-76	.028	.57
109	.47	2.78	115	145	4.58	106	130	145	155	165	182	195	205	223	237	249	280	350	1.0	1.0	2.5	6.7	4	2	.0	.0	18,965	150	70.0	10,500	<-76	.010	.64
110	.57	2.79	117	145	4.60	100	134	150	160	170	188	204	212	221	232	246	308	362	1.0	1.0	2.6	6.5	1.0	1.0	.1	.0	18,974	153.7	69.5	10,682	<-76	.012	-
111	.60	2.92	118	146	4.50	110	136	158	170	179	195	204	210	222	240	263	315	368	1.0	1.0	3.4	6.2	.0	.5	.2	.0	19,015	161.9	71.6	11,592	<-76	.010	.712
112	.74	2.92	121	146	4.53	102	129	144	155	164	183	198	212	227	240	260	317	356	1.0	1.0	2.6	6.7	-	.9	.0	.0	19,009	159.6	71.7	11,443	<-76	.01	-
113	.71	2.80	120	145	4.56	113	137	154	166	177	193	206	216	234	254	283	326	370	1.0	1.0	2.9	6.7	-	2	.0	.0	19,013	163.9	71.0	11,637	<-76	.03	.69
114	.96	3.54	125	150	4.54	110	137	152	170	180	200	212	220	228	246	278	331	372	1.2	1.3	3.3	6.8	-	1.5	.2	.5	19,024	166.1	71.4	11,859	<-76	.011	.77
115	.85	3.88	123	152	4.32	100	125	152	172	183	202	211	217	226	231	272	322	369	.5	1.0	4.7	6.9	-	2.2	.0	.0	19,015	164.0	70.7	11,595	<-76	.011	-
116	.50	3.0	116	147	4.29	116	145	162	175	185	200	211	218	227	245	278	337	380	1.0	1.0	3.0	5.6	-	.0	.0	.0	19,008	162.5	70.3	11,424	<-100	.010	-
117	.47	2.78	115	145	4.55	105	127	143	153	161	173	186	199	220	243	273	335	342	.9	1.1	2.6	6.5	1	1	.0	.0	18,992	156.2	71.0	11,090	<-80	.02	.68
118	.48	2.86	115	146	4.60	106	121	138	149	159	179	198	213	234	268	302	326	351	1.0	1.0	2.8	6.7	-	1.8	<.5	.0	18,941	147	68.9	10,128	<-76	.02	-
119	.53	2.85	116	145	4.56	104	127	144	160	169	185	195	210	222	254	273	322	354	1.0	1.0	3.3	7.0	.4	1.2	.0	.0	18,940	147	68.5	10,070	<-76	.010	.612
120	.64	2.8	119	145	4.60	99	126	148	163	174	191	203	214	228	257	272	326	362	1.0	1.0	3.7	6.5	1.2	2.6	.0	.0	18,956	151	68.3	10,313	<-76	.005	.625
Average 4/	.68	2.93	120	146	4.51	107	131	148	159	169	187	202	212	226	245	268	317	360	1.0	.9	2.8	6.6	1.2	1.2	.1	.1	18,992	156.3	70.5	11,019	<-76	.013	.638

29 samples

1/ Unless otherwise indicated, the figures for net heat of combustion are computed from the formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials: $Q = 17,608 + 0.2054\ (AG) - 7.24(10^{-6})(AG)^2$ for sulfur-free gasoline, where AG is the aniline-gravity constant. Corrected for sulfur content by the formula: $Q' = Q\ [1 - 0.01\ (\text{percent } S)] + 43.7\ (\text{percent } S)$.

2/ Determined value: ASTM D240 (proposed revision), a company modified method, FS 2501.2, or FS 2502.3. 3/ Fuel for commercial and military use.

4/ The samples represented include those tabulated with commercial fuels which are indicated by footnote 3 in the same grade.

TABLE 12. - Aviation jet fuel: Inspection test data furnished by participating companies on their products, 1956

Item 1/	Gravity, ASTM D287, ° API	Distillation, ASTM Method D86: Temperature range, ° F. (corrected to sea level), Percent evaporated						Distillation: 400° F. point, % evap.	Distillation: Percent		Reid vapor pressure, ASTM D323, lb.	Tag closed test flash point, ASTM D56, ° F.	Freezing point, FS 1411.3 ° F.	Color, Saybolt, ASTM D156	Kinematic viscosity, ASTM D445, centistokes at -30° F.	Water tolerance, ASTM D1094, ml.	Aniline point, ASTM D611 or equivalent, ° F.	Aniline-gravity constant	Bromine number, ASTM D875, D1158, D1159, gm. Br per 100 gm.	Total sulfur, ASTM D90 or equivalent, weight percent	Mercaptan sulfur, FS 5204 or equivalent, weight percent	Aromatic content, ASTM D875 or equivalent, volume percent	Olefins, ASTM D875 or equivalent, volume percent	Smoke point, mm., FS 2107, ASTM D1322	Smoke volatility index 2/	Gum, mg. per 100 ml.: Existent gum, ASTM D381, Steam jet at 450° F.	Gum, mg. per 100 ml.: 16 hour accelerated, ASTM D873, Steam jet at 450° F.	Net heat of combustion, Btu per lb. 3/	Hydrogen-carbon ratio, ASTM D1018 or equivalent
		IBP	10	20	50	90	EP		Res.	Loss																			
Grade JP-3 (MIL-F-5624C)																													
121	57.5	108	160	198	279	409	494	89	1.5	1.5	5.2	-	<-76	+27	-	0.0	132.1	7,596	1.1	0.08	0.0032	7.9	0.8	28	65.4	4/0.2	4/0.8	18,739	0.172
122	52.5	117	152	173	262	442	489	69	1.0	1.0	5.8	<-40	<-76	+26	2.5	.0	126.2	6,626	.7	.07	.003	12.0	1.0	27	56.0	1	1	18,641	.168
123	56.8	117	160	186	275	439	508	78.6	1.0	1.5	5.8	-	<-76	+26	-	.5	137.8	7,827	.64	.038	<.001	7.9	2.1	34	67.0	1.2	5.0	18,767	.163
Average 3 samples	55.6	114	157	186	272	430	497	78.9	1.2	1.3	5.6	-	<-76	-	-	.2	132.0	7,339	.81	.063	.0021	9.3	1.3	29.7	62.7	1.1	3.0	18,716	.168
Grade JP-4 (MIL-F-5624C)																													
124	55.1	156	233	253	283	335	416	98.7	0.3	0.7	2.5	-	<-76	+26	-	0.5	131.5	7,246	1.59	0.035	<0.001	10.2	2.8	34	75.5	0.4	3.2	18,711	0.160
125	56.6	138	216	234	273	332	400	99.5	.5	.5	2.7	-	<-85	+25	-	.5	133	7,528	-	.04	<.001	9.4	.6	32	73.8	.4	3.0	18,738	.162
126	55.1	144	216	240	290	364	422	97	1.0	1.0	2.8	-	<-85	+22	-	.2	132	7,273	-	.051	.0008	7.45	1.17	32.5	73.2	.9	1.9	18,712	.161
127	55.0	167	232	257	308	437	480	84	1.1	.9	2.3	-	<-76	+18	-	.5	145.9	8,025	3.4	.056	.002	9.0	1.8	32.0	67.3	.5	4.4	18,782	.168
128	50.3	134	218	264	366	432	473	69.5	1.0	.5	2.8	-	<-85	+15	-	.5	141	7,092	-	.03	.0013	9.05	1.95	28.5	57.7	4.6	5.0	18,696	.157
129	49.1	136	218	275	362	439	512	71.0	1.0	1.0	2.3	-	-84	+6	3.6	.0	137	6,727	2.3	.060	.005	11	1	25	54.8	1	1	18,654	-
130	56.3	170	224	248	299	366	446	96	1.0	1.0	2.1	-	-115	+30	2.29	.0	140	7,882	1.1	.053	(5)	6.5	-	39	79.3	.1	.9	18,770	.170
131	52.0	145	233	272	340	418	458	83	.5	1.0	2.2	-	-81	+30	3.19	.0	140	7,280	1.30	.020	.0008	7.4	.5	34	68.9	.4	1.2	18,717	.165
132	53.4	137	232	270	321	388	414	95	1.0	1.0	2.3	-	-105	+30	2.55	.0	131.7	7,033	1.16	.078	.0004	14.5	.95	27	66.9	.2	.6	18,683	.165
133	56.8	148	269	277	305	358	440	95.6	1.4	.6	2.3	-	<-100	-	-	.0	147	8,350	1.02	.026	.0008	8.18	.82	40	80.2	.9	.7	18,815	-
134	53.7	128	238	258	298	393	490	91.2	.8	.2	2.7	-	<-90	-	-	.0	137.2	7,368	.82	.042	.0013	10.2	.85	33	71.3	.7	1.6	18,722	-
135	51.0	133	233	288	358	421	455	80	1.0	1.0	2.4	-	<-76	+30	-	.0	140.2	7,150	.8	.030	.001	7.5	.8	29	62.6	.2	.4	18,702	-
136	50.3	136	200	221	280	435	484	78.5	1.0	.0	2.8	-	<-76	+19	3.6	.0	124.4	6,257	1.92	.10	.001	12.4	.5	25	58.0	.0	1	18,596	.160
137	50.2	150	173	188	296	451	497	68	1.0	1.0	2.7	-20	<-76	+25	2.7	.0	123.5	6,200	.8	.08	.002	12.0	1.0	26	54.6	1	1	18,592	.166
138	53.4	127	193	229	319	433	490	80.5	.6	.0	3.0	-	-82	+30	-	.0	136.0	7,262	.91	.09	<.0004	10.9	.78	33	66.8	.2	1.0	18,705	.172
139	52.4	130	200	238	315	435	486	79.5	.8	1.2	2.8	-	-78	+26	-	.0	136.6	7,158	-	.05	.004	11.0	1.0	32	65.4	1.1	3.1	18,700	-
140	53.8	155	195	214	269	455	522	83	1.0	1.0	2.7	-	<-76	+29	-	.0	132.0	7,102	1.0	.04	.001	10.4	1.0	27	61.9	1	2	18,695	-
141	52.9	138	195	240	302	385	510	93	1.5	1.5	2.7	-	<-76	+27	-	.0	133.5	7,062	.9	.05	.0024	10.7	.7	27	64.8	4/.2	4/.6	18,690	.169
142	52.4	140	199	248	337	418	474	82.5	1.0	1.0	2.7	50	-82	+21	-	.5	147.0	7,703	1.81	.035	.0008	9.1	.9	32	66.6	1.3	4.0	18,756	-
143	53.0	152	219	257	314	368	442	94.0	1.0	1.0	2.2	-	-100	-	-	.0	132.5	7,023	1.11	.038	-	11.2	2.2	30	69.5	4/.6	4/2.2	6/18,682	-
144	52.8	141	216	248	319	429	468	81	1.0	1.0	2.9	-	-83	+21	-	.5	135.0	7,128	-	.027	(5)	6.6	1.6	31	65.0	.5	1.1	18,698	-
145 7/	51.8	128	193	247	348	444	488	68.3	1.0	1.0	2.6	-	<-76	+16	-	.0	142	7,356	3	.050	.000	13	3	30	58.7	2	12	18,720	-
146	48.3	139	212	253	344	446	482	69.5	1.0	1.0	2.7	<70	<-76	+18	3.1	.0	128.5	6,207	.5	.07	.003	15.0	.2	25	54.2	1.0	1.0	18,594	-
147	53.0	142	192	211	292	446	498	82.0	1.0	1.0	2.9	<50	<-76	+28	2.53	.0	129.2	6,848	5	.028	.000	11	1.0	26	60.4	1	1	6/18,639	.172
148	51.9	137	259	282	319	395	477	92.0	1.0	1.0	2.7	<60	-94	+25	1.42	.0	132	6,851	.84	.05	.0001	11.4	2.0	27	65.6	.3	.8	6/18,810	.169
149	50.6	136	193	234	322	440	488	79	1.0	1.0	2.8	<70	-80	+15	3.41	<1	134	6,780	1.4	.040	.003	12.4	1.5	28.4	61.6	2.2	5.6	6/18,668	-
140 8/	48.1	143	234	281	338	403	442	88.5	1.0	1.0	2.6	-16	<-80	+21	3.31	.5	126.5	6,085	2.4	.20	.0002	12.4	2.1	22	59.2	.6	1.0	18,562	.160
151	52.9	142	217	260	325	396	456	91.1	1.1	.9	2.2	10	<-76	+25	2.8	.0	139.6	7,385	.9	.025	.0000	6.28	.72	32.9	71.2	.4	1.2	6/18,456	-
152	50.7	136	240	273	316	400	491	90	.5	1.0	2.8	-	-84	+20	-	.5	124	6,287	3.0	.03	.003	14.8	2.9	25.0	62.8	1.0	1.3	6/18,663	.171
153	52.7	141	231	263	320	380	420	95.5	1.0	1.0	2.1	<32	<-76	+25	2.78	.0	132.8	6,998	.0	.013	.0006	11.5	1.1	29.0	69.1	.2	.2	18,689	.166
154	49.9	144	214	251	339	432	487	78.0	1.0	1.0	2.6	-	<-76	-	-	.0	130.4	6,507	-	.136	.0001	13.3	.9	23.5	56.3	.4	3.2	18,619	-
Average 31 samples	52.4	142	217	251	317	409	468	85.0	.9	.9	2.6	-	<-76	-	2.87	.1	134.7	7,058	1.56	.054	.0013	10.5	1.3	29.6	64.9	.8	2.2	18,685	.165
Grade JP-4 referee fuel (MIL-F-5161C)																													
155	47.8	140	227	264	351	460	514	69.5	1.0	1.0	2.4	-	<-67	-	-	0.0	129.5	6,190	-	0.155	0.001	17.2	0.6	22.5	51.7	0.6	5.5	18,580	-
156 7/ 2 samples	48.0	152	221	268	359	468	518	67	1.0	1.0	2.7	-	<-76	+24	-	.0	132.2	6,346	2.0	.24	.001	14.8	1.06	24	52.1	1	3	18,586	-
Grade JP-5 (MIL-F-5624C)																													
157	37.7	372	389	397	418	468	515	25	1.0	1.0	-	9/146	-73	+21	12.0	0.0	134.2	5,059	4.5	0.26	0.0005	10.0	-	20	30.5	1.0	3.0	18,425	-
158 2 samples	39.3	366	386	394	422	472	510	27	1.0	1.0	0	9/146	<-40	+21	12.2	.0	140.9	5,537	3.2	.18	.001	12.8	1.4	21	32.3	.5	1	18,498	0.158

1/ Unless otherwise indicated, the fuels represented were manufactured for military use only.

2/ Smoke volatility index is computed: S.V.I. = S.P. (smoke point) + (0.42 x volume percent boiling under 400° F.), MIL-F-5624C, 18 May 1955, p. 2, Para. 3,2,4.

3/ Unless otherwise indicated, the figures for net heat of combustion are computed from the formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials: $Q = 17,608 + 0.2054(AG) - 7.24(10^{-6})(AG)^2$ for sulfur-free fuel, where AG is the aniline-gravity constant. Corrected for sulfur content by the formula: $Q' = Q\,[1 - 0.01\ (\text{percent S})] + 43.7\ (\text{percent S})$.

4/ Gum by air jet, not included in average. 5/ Mercaptan content not determined, sample was doctor sweet. 6/ Determined value: ASTM D240-50(FS 2501), FS 2502, or [illegible]

7/ Fuel for commercial and military use. 9/ Flash point by Pensky-Martens closed tester, ASTM D93-52.

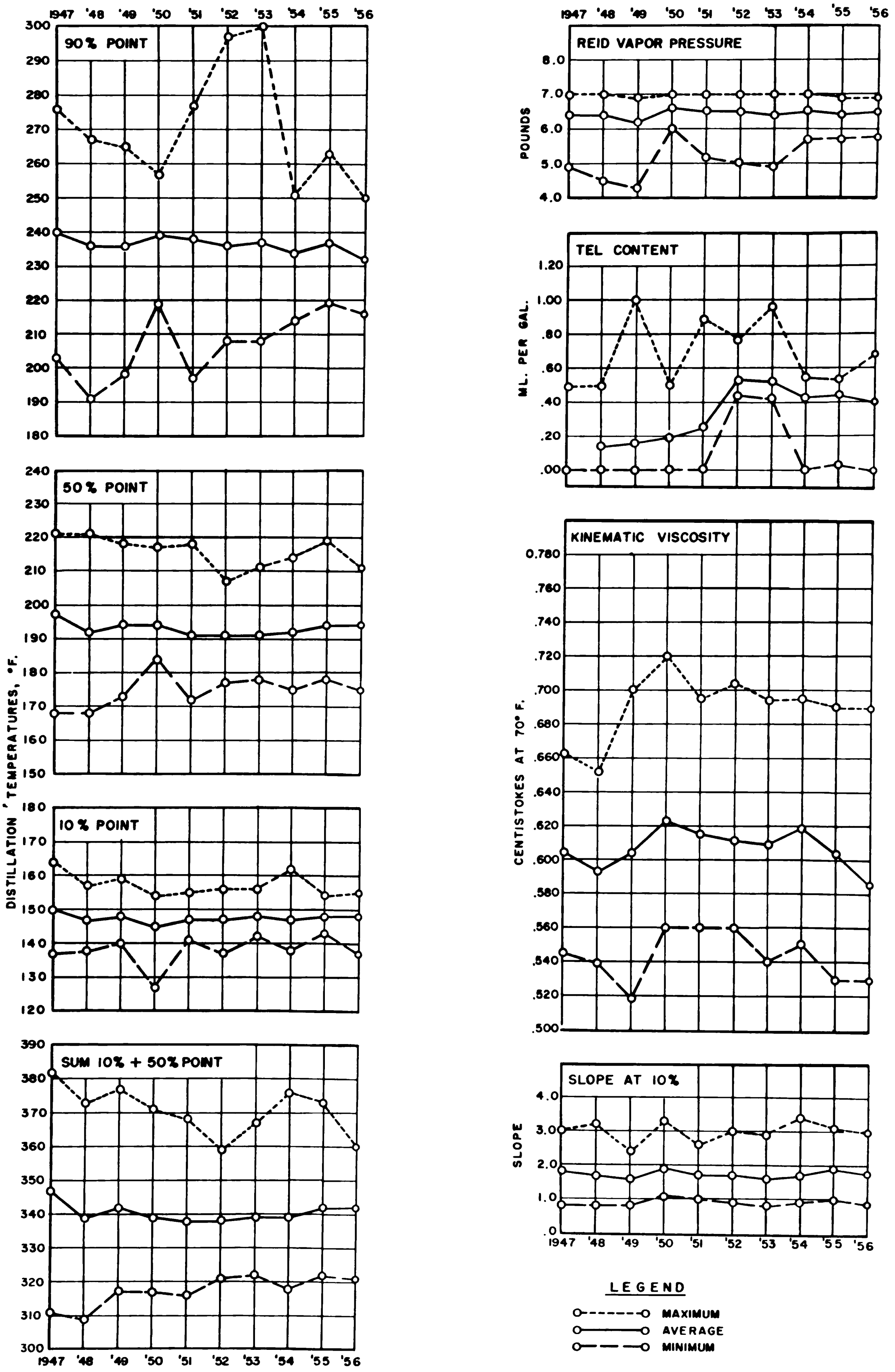

Figure 1. — Trends in grade 80/87 commercial aviation gasolines.

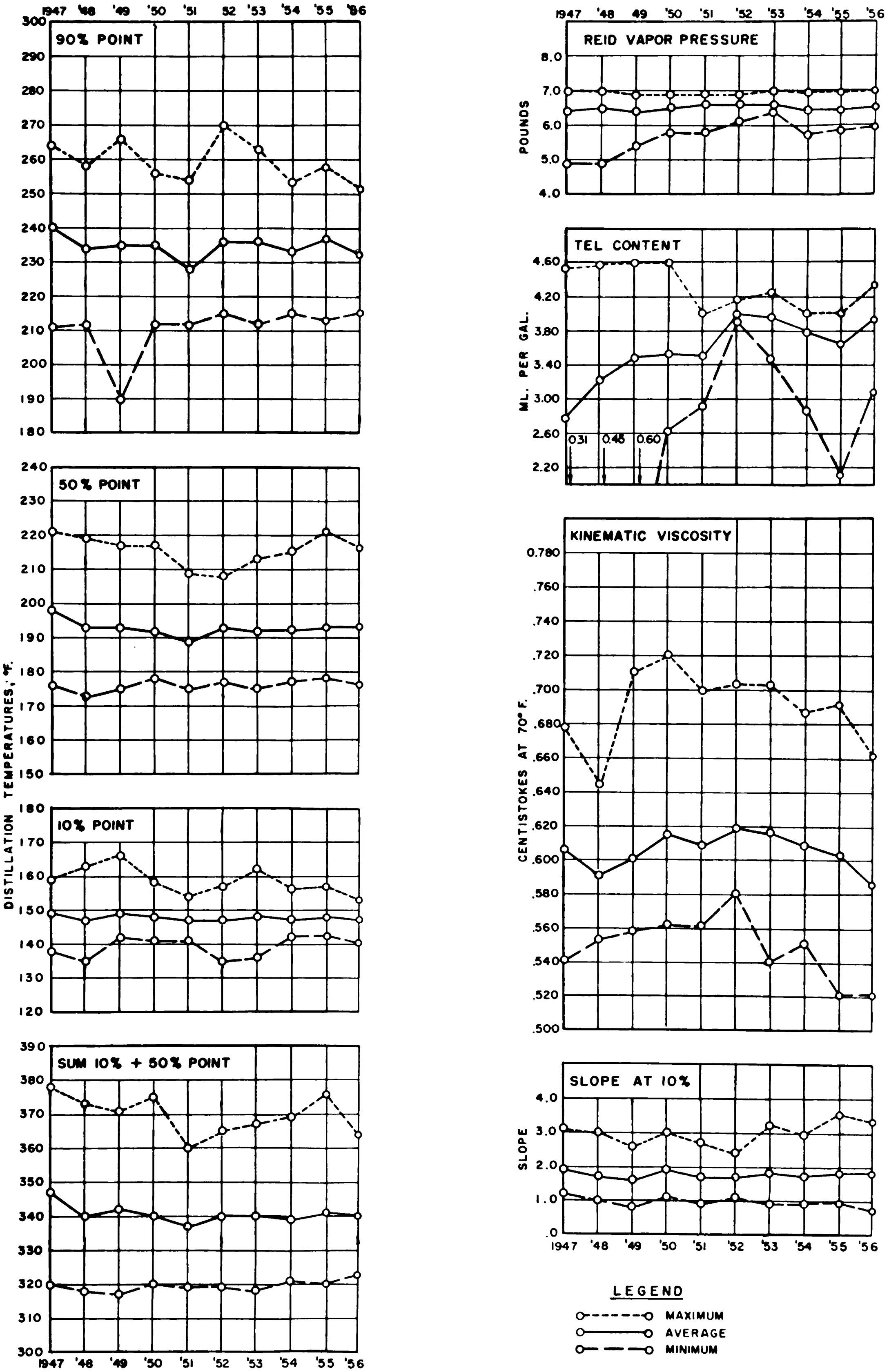

Figure 2.— Trends in grade 91/96 commercial aviation gasolines.

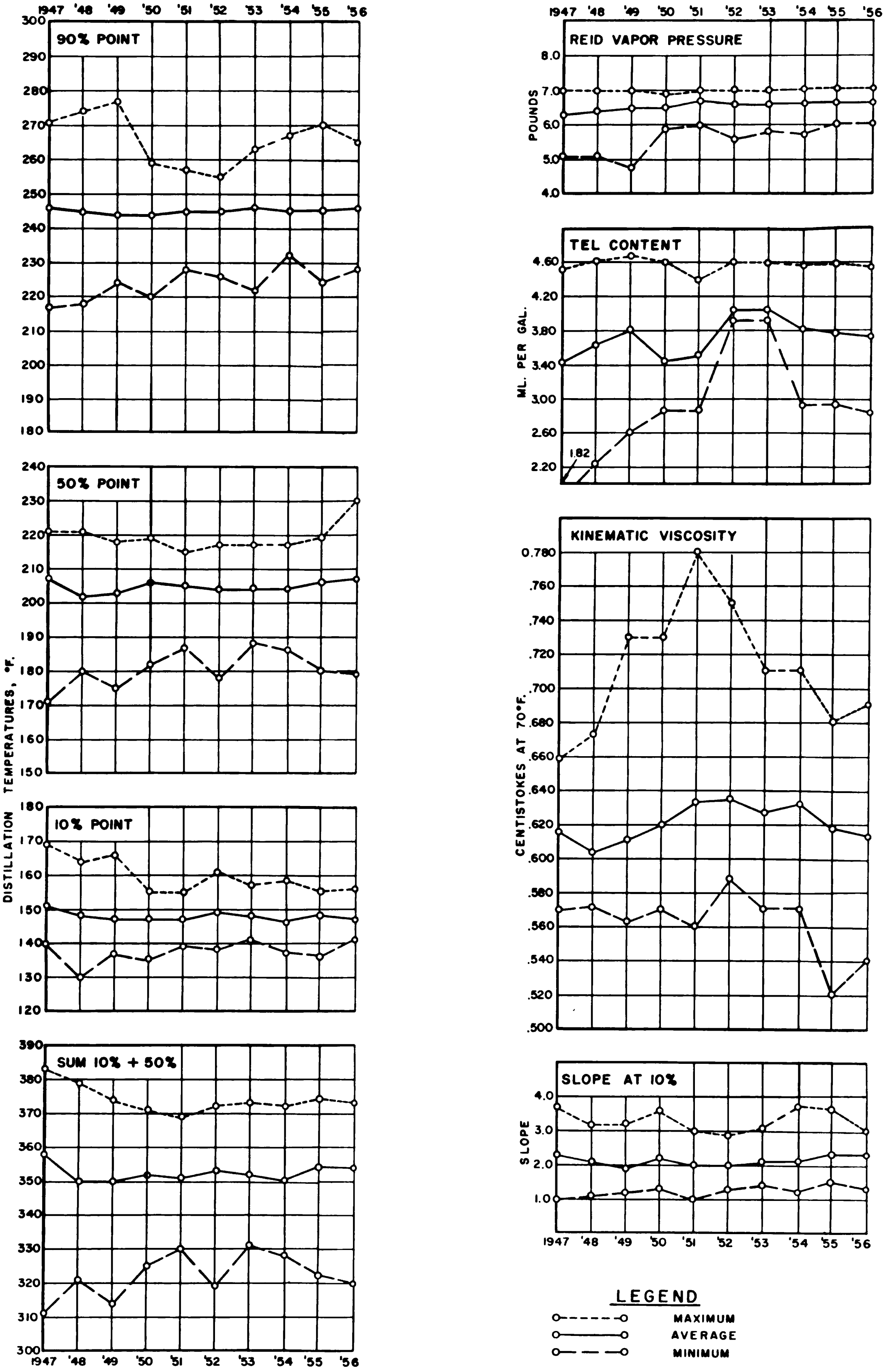

Figure 3.—Trends in grade 100/130 commercial aviation gasolines.

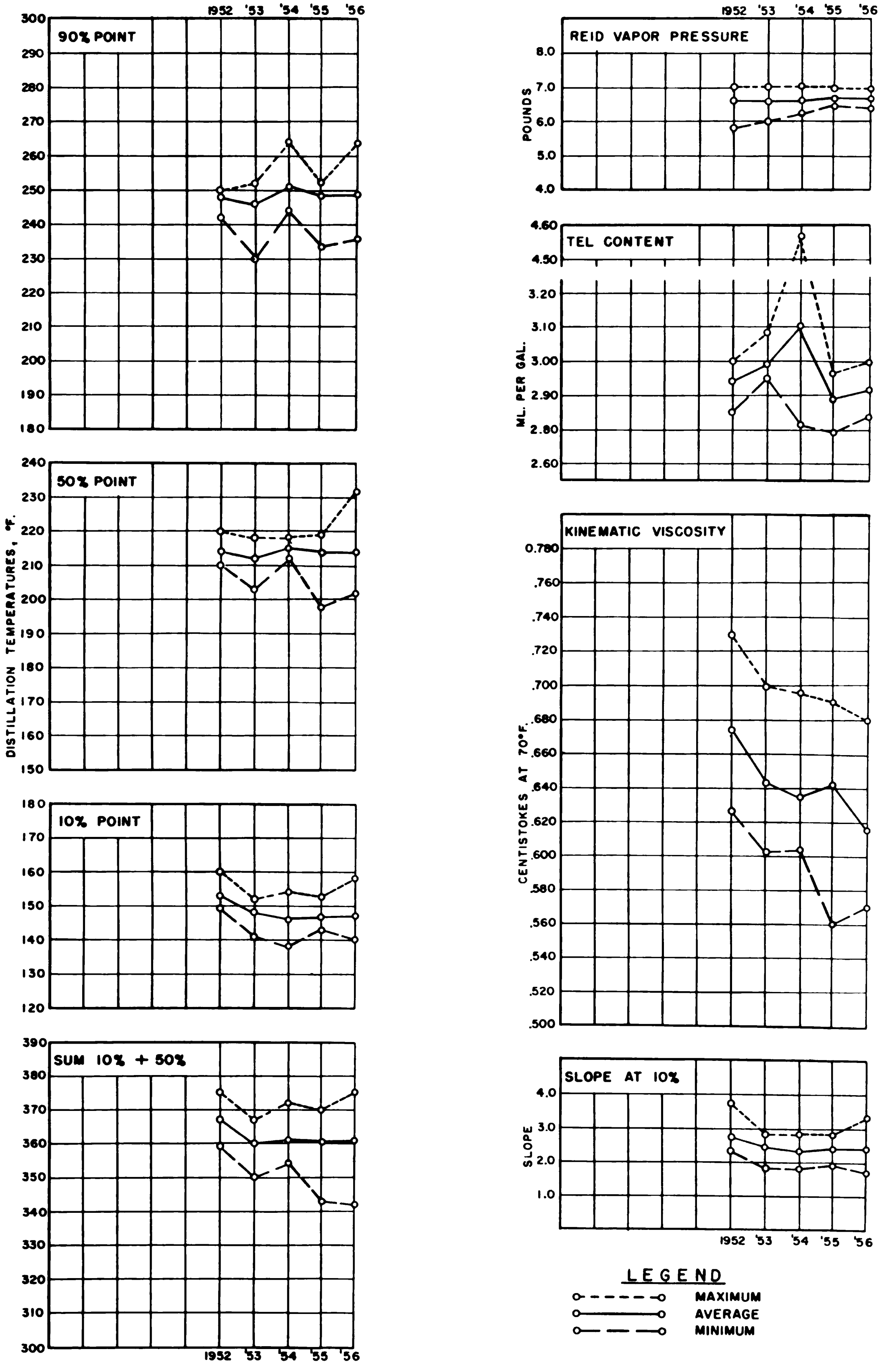

Figure 4.— Trends in grade 108/135 commercial aviation gasolines.

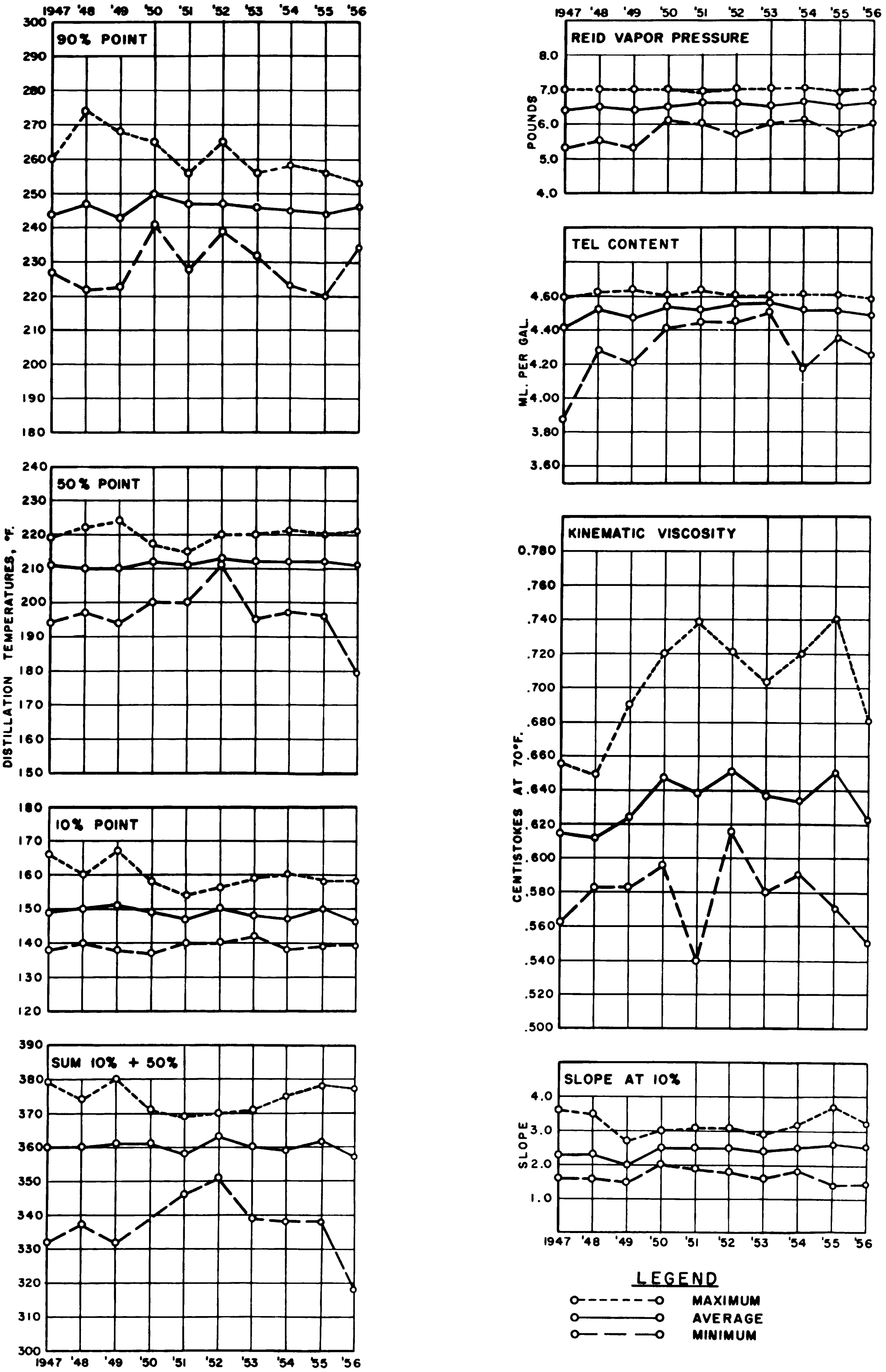

Figure 5. — Trends in grade 115/145 commercial aviation gasolines.

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